PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in Electric Lamps

I, GEORGE WILLIAM RAWLINGS, a British Subject, of Willow Meer, Park Hill, Kenilworth, Warwickshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to electric lamps of the directional-beam type.

One of my present objects is to provide a very inexpensive reflector, and, if desired, such reflector can function also as the cover.

A further object is to make use of light rays from the incandescent filament which would normally not be usefully utilised.

According to one feature of the invention, a reflector, for an electric lamp of the directional-beam type, is formed of a material which can be cast or moulded under pressure (such as that known under the registered trade mark Diakon or Perspex) to be rigid, substantially colourless and capable of having a highly-polished surface, and the reflector is of irregular thickness so as to provide a forwardly-directed face or faces and an inwardly-directed face or faces. The latter face or faces, and the rear face of the reflector, are so arranged that the relevant rays from the incandescent filament of an electric bulb appropriately mounted in the reflector will be totally reflected (i.e., their angle of incidence is above the critical angle), or substantially totally reflected, from the rear face, and the forwardly-directed face (or faces) is so arranged that the reflected rays will be transmitted substantially as a parallel beam. Preferably the reflector consists of one or more annular or parti-annular prisms arranged so that the relevant rays from the incandescent filament will be mainly or wholly reflected forwardly in a substantially parallel beam.

The invention further involves the combination therewith, of a lens or lenses interposed between the lamp bulb and the reflector for condensing some of the rays from the lamp bulb, in order to facilitate the shaping of the reflector, and in order that more rays from the lamp bulb may be usefully reflected.

The invention further involves a reflector formed as aforesaid and adapted also to function as the cover of the lamp. In that event the reflector has a forwardly-bulged portion providing a cavity extending forwardly from the rear face and of a size to receive the electric bulb, and the material round the cavity may be adapted to provide at least one lens for the purpose of condensing the light rays as aforesaid.

A further feature of the invention consists, in the case where the reflector of the invention is adapted also as the front cover, in forming the forward portion of the material round the cavity as a lens which will condense rays travelling forwardly from the filament.

For a better understanding of the nature of the invention, attention should be directed to the following description in which reference is made to the accompanying diagrammatic drawing the single figure of which is a sectional elevation through an electric lamp of the directional-beam type having the reflector arranged, and provided with lenses, according to the invention.

In the drawing A is a conventional lamp body or casing, preferably of metal, against the open end of which is secured in any convenient manner a rim portion B. This is formed, integrally with the reflector, of a thermo-plastic material as aforesaid. The refractive index thereof is substantially the same as that of crown glass, i.e., approximately 1.5. The inner face of the rim, as indicated at C, may be silvered so that the rim as a whole will have the appearance of an electro-plated and highly-polished metal.

It will be observed that the reflecting portion of the reflector is of irregular thickness both in axial and radial directions, providing a number of forwardly-directed faces D^1, D^2, D^3, D^4, and a number of inwardly-directed faces E^1, E^2, E^3, E^4. The rear face of the reflector in this instance includes a portion F^1 of truncated conical form, inclined to the main axis of the lamp at an angle of forty-five degrees, and a portion F^2 which is gradually curved therefrom, the curve being such that from the point F^3 to the point F^4 the tangents successively make

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an angle, of one degree less along each unit length of the rear surface, with the axis of the lamp, the angle being thirty-five degrees at the point F^4.

In the present instance the reflector functions also as the cover of the lamp and the lamp bulb G is mounted in a cavity H bounded by a cap portion J. This is of the same material as the rest of the reflector but in this instance is shown as being a separate part having a screw-threaded engagement therewith. Moreover, in the present instance it is shown as having three separate lens surfaces K^1, K^2 and K^3 formed on it.

It will be observed that certain of the rays from the incandescent filament passing through the surface K^1 are condensed and delivered substantially at right-angles to the axis of the lamp, the inwardly-directed face E^4 being parallel to this axis. These rays after striking the frusto-conical surface F^1 (this being inclined at an angle of 45° to the lamp axis) are directed forwardly in a parallel beam, the front face D^4 being at right-angles to the said axis and the front face D^3 also being at a right-angle thereto or substantially at such inclination or very slightly curved.

In like manner the rays passing through the surface K^2 are condensed and transmitted at such angles relatively to the surfaces E^3, E^2 and E^1 (which in this case have been arbitrarily chosen to be parallel to the axis of the lamp) that they will be totally reflected by the curved surface F^2, and the front faces D^3, D^2 and D^1 are arranged so that the emerging rays will be directed in a substantially parallel beam, as indicated. It will be observed that by means of the lens surfaces K^1 and K^2 the groups of rays L^1 and L^2 are being usefully used.

It will be obvious that the front face of the reflector may have more or less steps than those chosen, the lens surfaces K^1 and K^2 being modified accordingly, and also the rear surface of the reflector. The reflector illustrated actually consists of four annular prisms one or more faces of which are curved slightly, apart from the circularity. Obviously, if desired, the reflector can have but a single appropriately-shaped front face and a single inwardly-directed face, the rear face being appropriately shaped, but in that case an unnecessary amount of material would be used in the construction.

In the present instance the front of the cap portion J, being adapted to provide the lens surface K^2, condenses some of the direct rays as shown. The group of rays L^2 would not be forwardly directed with an ordinary paraboloidal reflector, and by means of the lens surface K^2 and the lens surface K^3 the light being directed forwardly in a parallel beam can be materially increased above what would be obtained with an ordinary paraboloidal reflector—in fact, substantially doubled.

Dated this 28th day of June, 1939.

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COMPLETE SPECIFICATION

Improvements in Electric Lamps

I, GEORGE WILLIAM RAWLINGS, a British Subject, of Willow Meer, Park Hill, Kenilworth, Warwickshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to lamps, and particularly electric lamps, of the directional-beam type—e.g. those adapted to direct light rays in a substantially parallel beam.

One of my present objects is to provide a very inexpensive reflector, and, if desired, such reflector can function also as part of the cover.

A further object is to make use of light rays from the incandescent filament which would normally not be usefully utilised.

The present invention consists, for a lamp of the directional-beam type, in the combination with a reflector which comprises a transparent or translucent annular or parti-annular prism, or of two or more such prisms disposed coaxially, arranged to direct light rays from a source of illumination in a substantially parallel beam, of a lens interposed between the reflector and the source of illumination and acting to condense some of the light rays in order that the correct shaping of the reflector may be simplified and/or in order that more rays from the source of illumination may be usefully reflected by the reflector in the substantially parallel beam.

In carrying out the invention, the reflector is preferably formed of a material which can be cast or moulded under pressure (such as that known under

the registered trade mark Diakon or Perspex) to be rigid, substantially colourless and capable of having a highly-polished surface, the reflector being of irregular thickness so as to provide a rear face, a forwardly-directed face or faces and an inwardly-directed face or faces. The latter face or faces, and the rear face of the reflector, are so arranged that the relevant rays from the incandescent filament of an electric bulb appropriately mounted in the reflector will be totally reflected (i.e., their angle of incidence will be above the critical angle), or substantially totally reflected, from the rear face, and the forwardly-directed face (or faces) is so arranged that the reflected rays will be transmitted substantially as a parallel beam.

By combining therewith a lens or lenses interposed between the source of illumination and the reflector for condensing some of the rays from the said source, the correct shaping of the reflector will be simplified, and in addition more rays from the said source may be usefully reflected from the reflector in the said parallel beam.

For a better understanding of the nature of the invention, attention should be directed to the following description in which reference is made to the diagrammatic drawing accompanying the Provisional Specification, the single figure thereof being a sectional elevation through an electric lamp of the directional-beam type having a reflector and a lens or lenses arranged according to the invention.

In the drawing A is a conventional lamp body or casing, preferably of metal, against the open end of which is secured in any convenient manner a rim portion B. This is formed, integrally with the reflector, of a thermo-plastic material as aforesaid. The refractive index thereof is substantially the same as that of crown glass, i.e., approximately 1.5. The inner face of the rim, as indicated at C, may be silvered so that the rim as a whole will have the appearance of an electro-plated and highly-polished metal.

It will be observed that the reflecting portion of the reflector is of irregular thickness both in axial and radial directions, providing a number of forwardly-directed faces D^1, D^2, D^3, D^4, and a number of inwardly-directed faces E^1, E^2, E^3, E^4. The rear face of the reflector in this instance includes a portion F^1 of truncated conical form, inclined to the main axis of the lamp at an angle of forty-five degrees, and a portion F^2 which is gradually curved therefrom, the curve being such that from the point F^3 to the point F^4 the tangents successively make an angle, of one degree less along each unit length of the rear surface, with the axis of the lamp, the angle being thirty-five degrees at the point F^4.

In the present instance the reflector functions also as the cover of the lamp and the lamp bulb G is mounted in a cavity H bounded by a cap portion J. This is of the same material as the rest of the reflector but in this instance is shown as being a separate part having a screw-threaded engagement therewith. Moreover, in the present instance it is shown as having three separate lens surfaces K^1, K^2 and K^3 formed on it.

It will be observed that certain of the rays from the incandescent filament passing through the surface K^1 are condensed and delivered substantially at right-angles to the axis of the lamp, the inwardly-directed face E^4 being parallel to this axis. These rays after striking the frusto-conical surface F^1 (this being inclined at an angle of 45° to the lamp axis) are directed forwardly in a parallel beam, the front face D^4 being at right-angles to the said axis and the front face D^3 also being at a right-angle thereto or substantially at such inclination or very slightly curved.

In like manner the rays passing through the surface K^2 are condensed and transmitted at such angles relatively to the surfaces E^3, E^2 and E^1 (which in this case have been arbitrarily chosen to be parallel to the axis of the lamp) that they will be totally reflected by the curved surface F^2, and the front faces D^3, D^2 and D^1 are arranged so that the emerging rays will be directed in a substantially parallel beam, as indicated. It will be observed that by means of the lens surfaces K^1 and K^2 the groups of rays L^1 and L^2 are being usefully used.

It will be obvious that the front face of the reflector may have more or less steps than those chosen, the lens surfaces K^1 and K^2 being modified accordingly, and also the rear surface of the reflector. The reflector illustrated actually consists of four annular prisms one or more faces of which are curved slightly, apart from the circularity. Obviously, if desired, the reflector can have but a single appropriately-shaped front face and a single inwardly-directed face, the rear face being appropriately shaped, but in that case an unnecessary amount of material would be used in the construction. In point of fact, two is very satisfactory.

In the present instance the front of the cap portion J, being adapted to provide the lens surface K^3, condenses some of the direct rays as shown. The group of

rays L^2 would not be forwardly directed with an ordinary paraboloidal reflector, and by means of the lens surface K^2 and the lens surface K^3 the light directed forwardly in a parallel beam can be materially increased above what would be obtained with an ordinary paraboloidal reflector.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. For a lamp of the directional-beam type, the combination with a reflector which consists of a transparent or translucent annular or parti-annular prism, or of two or more thereof disposed coaxially, arranged to direct light rays from a source of illumination in a substantially parallel beam, of a lens interposed between the reflector and the source of illumination and acting to condense some of the light rays in order that the correct shaping of the reflector will be simplified and/or in order that more rays from the source of illumination may be usefully reflected by the reflector in the said substantially parallel beam.

2. The combination according to Claim 1, in which the lens is formed on a cap portion formed integrally with or secured to the reflector whereby to enclose the source of illumination from the front, so that the reflector and cap portion can function also as the front cover.

3. The combination according to Claim 1 or 2, in which there is a further lens to condense non-reflected rays from the source of illumination and direct them in a substantially parallel beam, the two lenses being integrally formed.

4. An electric lamp constructed substantially as hereinbefore described with reference to the drawing accompanying the Provisional Specification.

Dated this 12th day of February, 1940.
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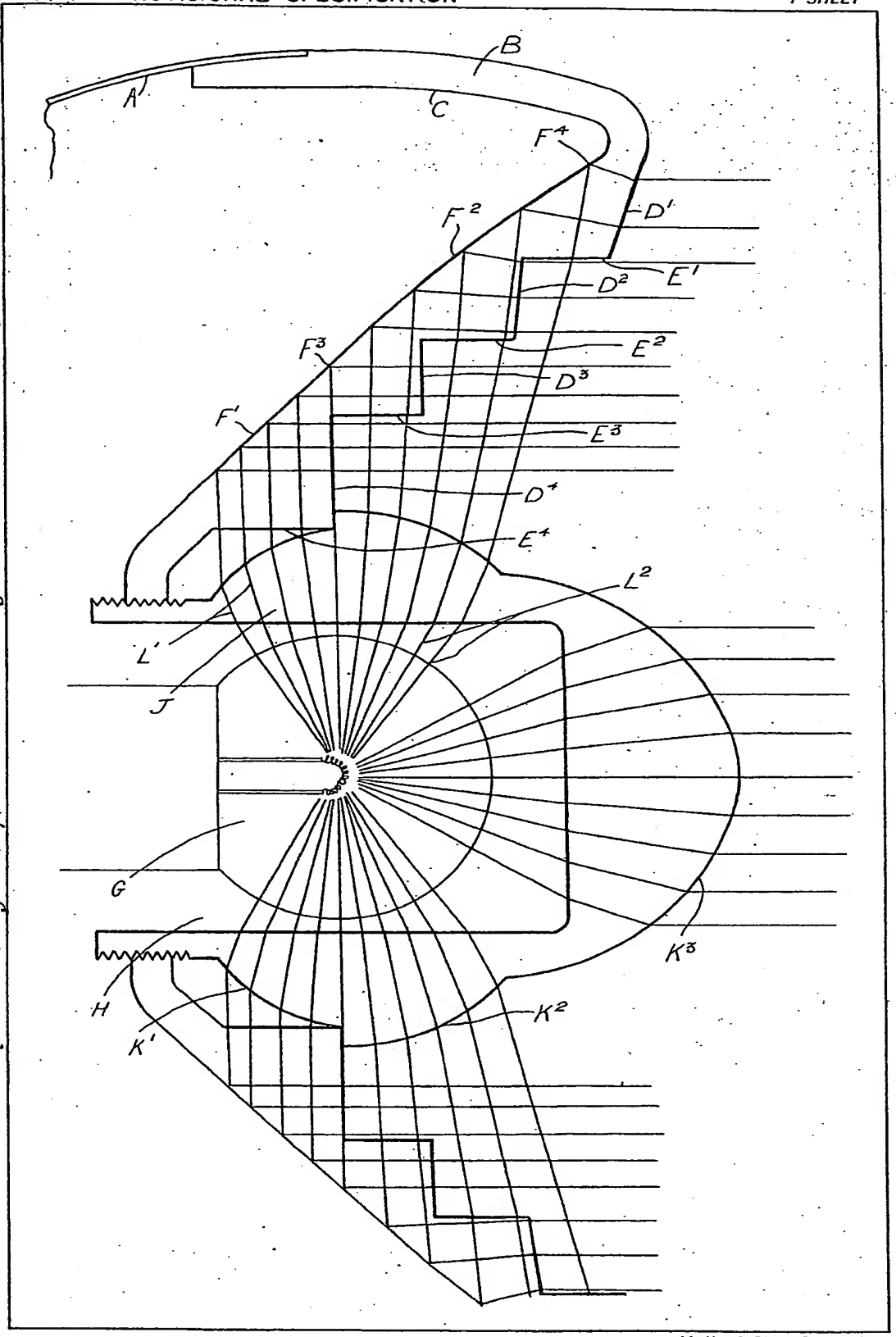

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